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AN
INAUGURAL DISSERTATION
ON THE USE OF
DIGITALIS PURPUREA,
OR
PURPLE FOXGLOVE,
IN THE CURE OF DISEASES.

SUBMITTED TO THE PUBLIC EXAMINATION OF THE
FACULTY OF PHYSIC
UNDER THE AUTHORITY OF THE
TRUSTEES OF COLUMBIA COLLEGE,
IN THE
STATE OF NEW-YORK;

The Right Rev. BENJAMIN MOORE, D. D. President;

FOR THE DEGREE OF
DOCTOR OF PHYSIC,

ON THE 4th OF MAY, 1802.

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OF NEW-YORK.

NEW-YORK:

Printed by T. & J. SWORDS, Printers to the Faculty of Physic
of Columbia College.

1802.

AN
INAUGURAL DISSERTATION
ON
DIGITALIS PURPUREA.

Of the Digitalis Purpurea, or Purple Foxglove.

THE *Digitalis Purpurea* is placed by Linnaeus in the class of didynamia, and order of angiospermia.

Botanical Description.

The foxglove grows to the height of four or five feet, with an erect and tapering stalk. The leaves are large, hairy, oblong, and pointed. Their colour is a dark dusky green, approximating to brown. The leaves exhale a strong odour, something similar to tobacco, and have a bitter and nauseous taste; but are not so acrid and pungent as many other veget-

ables which are administered in larger doses with perfect safety. The nauseous and bitter qualities of the leaves can be imparted to watery and spirituous menstua.

The floral leaves or bracteæ are spear-shaped, and purplish towards their points. The calyx consists of five elliptical segments. The flowers are monopetalous, and of a purple colour: they have some resemblance to the finger of a glove, whence the name *digitalis*, or foxglove, originates.

The foxglove grows in India, is found in many parts of Europe, and has been cultivated in this country. It grows wild in woods when left to nature, and flowers in June, July, or August. The *digitalis* is a biennial plant, which arrives at its full growth and native perfection only in gravelly soils, where there is present little or none of the calcareous earth.

*Of the growth and method of curing the
Foxglove.*

By consulting writers upon the natural history of this vegetable, we find that barren,

gravelly, or sandy soils, and hedges and such situations as are considerably elevated, are the only places in which it flourishes and arrives at its fullest maturity. Botanical authors relate that it delights in shade and in deep hedge-rows, and that sheltered ground is the favourite situation of foxglove.

This vegetable has lately been cultivated in the suburbs of this city, and does not appear to degenerate. It grows to its usual height, and puts on the appearance of health and vigour.

Some plants arrive at the highest perfection in their original wild state, in woods, and among shrubs and bushes. But this is not the case with all herbs, and probably it is not the case with digitalis. The foxglove which received its growth here has been put to the test of experiment. It has been administered in tincture and in substance. No peculiarity or defect is observed in its operations on the human body. The effects produced are similar to those which the imported foxglove usually produces.

The general employment of digitalis has excited much attention with respect to the

method of collecting and curing the leaves, and the mode of preparing them for use.

When the leaves of foxglove are gathered for the purpose of preserving them a number of years, they should be collected from healthy, vigorous plants, growing on hills, in an unmanured soil, and in situations which are most exposed to the rays of the sun. Such plants as have acquired a darkish and brownish colour are preferable to others. After the leaves are collected they are carefully separated from the stalks, and the latter cut away, so as only to leave room to tie them into small bunches, which are hung in a warm and airy apartment. This apartment has a current of air passing through it, and the rays of the sun excluded.

The leaves, when dry, are partially powdered; by which operation the stalks and fibrous parts are almost completely separated. The finer part of the leaves, when sufficiently pulverized, is bottled and closely corked, to prevent the admittance of air, for future use.

Another method of preserving this valuable medicine, not inferior to the one already

mentioned, is the following:—After dividing the leaves into several pieces, compress them into a tight and convenient box or canister. Keeping them close in this state, and in a dry situation, they will preserve their virtues unimpaired for many years.

With respect to the time of gathering the green leaves, Dr. Withering directs that they be gathered “about the time the flowering stem has shot up, and when the blossoms are coming forth.” However, from repeated trials it is found that if they be collected late in summer, or even in autumn, provided they receive no injury from cold or frost, their virtues are probably augmented, and their medicinal qualities certainly not impaired.

Different preparations. 1. The substance. 2. The decoction. 3. The infusion. 4. The tincture.

1. The most simple method of administering the foxglove is in powder, or in the form of pills. Half a grain, or one grain of the substance, is a sufficient quantity for a patient to begin with. The pulverized seeds are, on

many accounts, preferable to the leaves. “In them the whole virtues of the plant are concentrated.”

2. There are many persons of peculiar habits of body, who are incapable of taking medicine in the form of pills. They almost immediately induce in them nausea and vomiting. In such cases liquid medicines are preferable: they can generally be retained in the stomach with great facility. A decoction of the *digitalis*, made according to the following formula, is exhibited with much advantage:—On two drams of the dried leaves of foxglove pour two quarts and a pint of water, and boil down the contents to two quarts. Half an ounce of this can be taken two, three or four times a day.

3. A slight decoction is injurious to many plants not more volatile than *digitalis*: a lengthy and violent decoction will certainly dissipate the virtues of this valuable article of the *materia medica*. Dr. Withering and others consequently preferred the infusion. The method of preparing it, as Dr. Withering directs, is as follows:—Let one dram of the dried leaves be infused for four hours in

half a pint of boiling water; add to the strained liquor half an ounce of any spirituous water: an ounce of this to be given twice a day to an adult.

For the purpose of bringing the system gradually under the influence of digitalis, the following is, perhaps, the most judicious formula:—On one dram of the powdered leaves pour a quart of boiling water, and let it stand for forty-eight hours.

One ounce of the dried leaves is equal to four of the green, for the purpose of either decoction or tincture.

4. *The Tincture.*

Another mode of exhibiting foxglove is by making a saturated tincture. Dr. Darwin gives it the preference, and lays down the following rule:—“Put two ounces of purple foxglove, *digitalis purpurea*, nicely dried and coarsely powdered, into a mixture of four ounces of rectified spirit of wine and four ounces of water; let the mixture stand by the fire-side twenty-four hours, frequently shaking the bottle, and thus making a saturated

tincture of digitalis; which must be poured from the sediment and passed through filtering paper. Thirty drops of this tincture is directed to be put into an ounce of mint water for a draught to be taken twice or thrice a day, till it reduces the anasarca of the limbs, or removes the difficulty of breathing in hydrothorax, or till it induces sickness."

The object of this preparation is to impart as much of the active parts of the leaf as the spirit is capable of taking up and retaining in solution. If digestion be continued a week or more, a very important object is gained; half the quantity of leaf being sufficient, and a larger quantity of the tincture of equal efficacy is procured. If the digestion be conducted in a cool temperature, it is less liable to variation: it becomes more uniform and permanent in different temperatures. The following formula, agreeable to the above directions, is a very valuable one, and has been proposed as a standard for universal use.

Recipe,

Folior. digit. purpur. recent. exsiccat unc. i.

Sps. vin. unc. viii. M.

Digere leni calore per dies septem.

Or—Recipe,

Folior. digit. purpur. recent. unc. ii.

Sps. vin. rect. unc. v. M.

Digere dies septem leni calore.

Mode of Exhibition.

Physicians differ in opinion respecting the method of exhibiting the digitalis purpurea. Some prefer its substance in powder or in pill; others declare that its virtues are extracted, and that it operates with much greater efficacy in decoction or in tincture.

It is said that the powder more speedily nauseates, and more readily increases the discharge from the kidneys or intestines; and therefore that it is not so serviceable in pulmonary complaints. As the principal object, by exhibiting this medicine, is to diminish vascular action; and as this end can be accomplished by either the tincture or the powder, any disputation about which of these two ought to be employed is unnecessary. Perhaps it is agreeable to truth and matter of fact to state, that there is no difference in the effect produced on the system by different pre-

parations of this remedy, provided the dose be in all cases exactly the same.

It is not possible at all times to determine with precision the exact quantity of digitalis contained in a given quantity of liquid. At the time of preparing a decoction or infusion, many accidents and circumstances may occur to render it doubtful how much of the active virtues of the plant may be present in a given dose.

It is a desideratum in medicine to have a preparation which may serve as a general standard, possessing its virtues unimpaired at all times and in all places. A saturated tincture can best answer this intention.

That sensible organ the stomach, through the agency of which the action of medicines is conveyed throughout the body, in a great degree, becomes insensible to their operations, after it has been accustomed to them for some time. An augmentation of the dose becomes necessary to produce the same effect. Very irritable stomachs are unable to retain a full dose of digitalis. This observation holds good with respect to many other active remedies, such as opium, cicuta, the squills, and hy-

drargyrum: hence the necessity and advantage of gradually augmenting the dose of active remedies in the treatment of obstinate chronic diseases.

The following method, if adhered to, is found to be a valuable practical rule:—Begin with adults in doses of ten drops of the tincture, or half a grain of the powder, or one table spoonful of either the decoction or infusion, repeated three times a day; gradually enlarging the dose, if no disagreeable symptoms ensue, as the exigency of the case may require. If nausea, vertigo, or great irregularity of pulse supervene, the doses must be diminished, or totally omitted for a time. In children the medicine should be lessened in quantity in proportion to their ages. By this manner of exhibition the weakest constitution and the most irritable habit of body may be sufficiently charged with the influence of the purple foxglove.

Modus operandi.

Some physicians imagine that the good effects of foxglove result from its power of di-

minishing secretion and promoting absorption. But it may be objected in reply, that foxglove proves very serviceable in cases where there is no increase of pus or mucus, as, for instance, in dry coughs and dyspnœa.

Digitalis does not always prove effectual by reducing the frequency of the pulse: several instances have been remarked where the pulsations appeared to be somewhat increased, and yet a complete cure effected.

The manner in which digitalis operates is explained by Dr. Darwin in the following words:—"From the great stimulus of this medicine the stomach is rendered torpid with consequent sickness, which continues for many hours and even days, owing to the great exhaustion of its sensorial power of irritation: and the action of the heart and arteries becomes feeble from the deficient excitement of the sensorial power of association: and, lastly, the absorbents of the cellular membrane act more violently in consequence of the accumulation of the sensorial power of association of the torpid heart and arteries."

When a small quantity of foxglove is at first taken, and the dose gradually augmented,

the patient feels the following effects and changes.—Torpor and heaviness of the whole body, languor and indifference to voluntary exertion, slight nausea, vertigo, pain and a sense of lightness in the head: then, if the medicine be persisted in, comes on extreme nausea and vomiting; objects appear of a green colour. If the urine be sensibly increased in quantity, these symptoms are not so violent, or a longer space of time is required to produce the same effects.

The pulse becomes affected in a remarkable manner; the heart and arteries beat less frequent, or with great irregularity; while feeling the pulse of a patient, it sometimes appears as if the action of the heart was for a moment suspended; general irritation is allayed; the actions of the absorbent vessels are increased; the lymphatics are placed in a state of carrying on healthy absorption, and continue so till they regain their former habit of action.

If forty drops of the tincture, or two grains of the substance of *digitalis*, be thrown into some irritable stomachs, it will speedily produce nausea and vomiting, which evinces

the propriety of beginning with small doses, as already mentioned, and of making a gradual increase, that the stomach may be habituated to their operation. By these precautions the effects of foxglove are observed before they become excessive.

The reduction of vascular action without inducing previous excitement, is peculiar to the digitalis purpurea.

Correctors of the deleterious effects of Digitalis.

As digitalis diminishes the power and activity of the arterial system, it is of importance that some substance should be given with it, which, while it permits the digitalis to produce this effect, might also prevent that extreme languor which often proceeds so far as to sink the patient. Some physicians have thought that Seneka snake-root will frequently serve this purpose; and that calomel, combined with the powder of digitalis, is also a corrector of it. Steel will also aid the system in such cases; for if wine and the more diffusible stimuli, or the tonics joined with much aroma, should be given, then too much

excitement would be produced after the excitability had been accumulated by the torpor and languor produced by the digitalis. Steel, we know, is a pure tonic, and only produces stimulant effects in a moderate manner: whenever, therefore, the stomach is first affected, the nausea will be carried off by the suspension of the digitalis, and the administration of porter or some bitters. When the pulse is affected the stomach seldom partakes; and then the pulse may be raised by giving some steel, or tincture of bark, although the digitalis be persisted in. If vertigo be produced, the foxglove must absolutely be desisted from; and then steel and the warm bath are the proper correctives.

Diseases in which Digitalis proves of benefit.

1. In inflammatory diseases attended with local congestion. 2. In consumption. 3. In dropsy.

1. In the first class of diseases, the foxglove is serviceable upon the principle of its operating quickly and powerfully upon the arterial system, and thereby arresting the rapid pro-

gress of the inflammatory symptoms. Croup, pleurisy, peripneumonia, chronic cough, catarrh, mania, and hooping-cough, are cured by the use of digitalis.

Case of chronic cough.

A. L. aged 38, has been troubled for eighteen months past with a continued cough. At present breathes with difficulty: voice hoarse; coughs violently at times; expectorates mucus; sleeps ill for the most part; pulse 96, full and strong.

December 28th. Took half a grain of digitalis, and the same quantity of opium made into a pill, three times a day.

30th. Pulse nearly the same; sleeps rather better; bowels costive. Took five grains of calomel with each pill until a stool was procured.

January 1st. Is better in every respect; urine increased in quantity. The digitalis is increased to one grain.

3d. Coughs more; pulse 90; complains of weakness in the joints. The pills are omitted, and half a grain of digitalis and one grain of opium are taken morning and evening.

5th. Is better in every respect; pulse 86; expectorates less.

7th, 9th, 11th, 14th, 18th. Gets better; pulse slow; urine increased in quantity.

20th. Complains of debility. Was put on the use of tonic medicines, and has since recovered.

2. *Consumption.* The foxglove was formerly used with advantage in epilepsy, and in scrophula, taken either internally, or applied externally in the form of ointment. It has long since been recommended for consumption also; but from want of knowledge of its properties, and mode of exhibition, it was employed with such caution that the sick were left without relief and without hope.

In phthisis the foxglove acts on the system and corrects its morbid phenomena, by producing absorption—allaying the cough and the augmented irritation of the lungs—and diminishing the action of the heart and arteries.

Case.—Deborah G—, aged 18, of a delicate habit of body, upon making an excursion into the country was taken with chills, succeeded by hot fits, slight cough, impaired

appetite, and a stoppage of the menstrual discharge. No medical aid being applied for four months, the symptoms increased in violence, and daily grew more alarming.

November 8th. Coughs and expectorates considerably; sleeps little; has pain in the left side, and difficulty of deglutition; exacerbations of fever morning and evening, and colliquative sweats. Took of the tincture of digitalis ten drops three times a day.

9th, 10th, 11th. No sensible effect produced by the digitalis; pulse 88.

12th. Urine increased; cough and expectoration as before.

13th. The tincture increased to twelve drops.

14th. Expectorates less. Digitalis taken four times a day.

15th. Is delirious at times; expectorates little; coughs more. Medicine omitted.

18th, 19th. Cough less; sleep and appetite better; expectorates freely.

In phthisis pulmonalis it has been observed in the New-York hospital, that it was an unfavourable symptom when digitalis did not lessen the frequency of the pulse; and in such

cases the patient generally showed after death tubercles in the lungs.

3. *Dropsy*. The indications of cure in this complaint are, 1st. To evacuate the superabundant fluid: 2d. To prevent its farther accumulation. To obviate the first indication active diuretics are employed, in order to stimulate the kidneys and determine the serous fluid to those passages.

From sympathy, or an indissoluble association between the heart and stomach, if nausea be produced, the pulse sinks in consequence. As arterial action is diminished absorption begins: hence the use of emetics to produce absorption. By means of the digitalis absorption can be produced from the lungs, abdomen, &c. without the disagreeable intervention of nausea and vomiting. This remedy is found to be most serviceable in the following species of dropsy: Ascites, anasarca of the lungs, hydrops pericardii, hydrops thoracis.

Case of Ascites.

James H——, shipcarpenter, of strong muscular fibre and plethoric habit, having exposed himself, in the month of September, to much rain and a chilly night air, was attacked with fever, which was subdued by the usual remedies. A few days after apparent recovery he again exposed himself to a very damp and cool atmosphere.

October 2d. Complains of pain in the head and abdomen; ordered a dose of calomel.

4th. Pain in the head better; urine scanty.

6th. Has a sense of weight, fullness, and tightness of the abdomen; great thirst; a fluctuation in the abdomen perceptible.

7th. Took twelve drops of the tincture of digitalis morning and evening.

8th. No sensible change.

9th. Much as before. Took twelve drops three times a day.

10th. Urine increased in quantity; the dose augmented to fifteen drops.

11th, 12th. No pain; respiration free.

14th. The abdomen is of its natural size.

RECAPITULATION.

1. Digitalis, if carefully and gradually exhibited, may ultimately be given with perfect safety in large doses.

2. When digitalis is exhibited repeatedly, and at short intervals, the strictest caution is necessary to prevent the alarming and even fatal consequences which may ensue.

3. When the system becomes charged, and completely under the influence of digitalis, it possesses a power of arresting the motion of the heart and arteries to a degree hitherto thought incompatible with the existence of animal life.

4. Digitalis, in simple inflammatory diseases, may supersede the necessity of repeated bleeding and purging.

5. Digitalis is an excellent remedy in anasarca of the lungs, and in cases where effusion or inflammatory exudation has taken place.

6. The foxglove is a glorious remedy in active hæmorrhage, by retarding the velocity of the circulation.

7. In pulmonary consumption, arising from hæmoptysis, much relief is obtained from the use of digitalis.

8. Digitalis is useful in chronic coughs, in spasmodic asthma, and in palpitations of the heart not depending on debility, upon the principle of diminishing irritability.

9. The criterions by which we are to be guided in regulating the doses of foxglove, are the phenomena arising from its action on the stomach, on the sensorium, and on the blood-vessels.

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Med. Hist.

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